APPENDIX

THE GLOBAL INSIGHT U.S. MACROECONOMIC MODEL

Global Insight's Macroeconomic Model is a multiple-equation model of the U.S. economy. Consisting of over 1,200 equations, the model is solved iteratively to generate the results of different policy and forecast scenarios. The model incorporates the best insights of many theoretical schools of thought to depict the economic decision processes and interactions of households, businesses, and governments.

The Global Insight model is divided into the following eight major sectors:

I Private Domestic Spending
II Production and Income
III Taxes
IV International Transactions
V Financial
VI Inflation
VII Supply
VIII Expectations

I. **Private Domestic Spending.** Major aggregate demand components include consumption, investment, and government. Consumer purchases are divided among three categories: durable goods, nondurable goods, and services. In nearly all cases, real expenditures are influenced by real income and the relative price of consumer goods. Durable and semidurable goods are also sensitive to household net worth, current finance costs, and consumer sentiment.

Global Insight divides investment into two general categories: fixed investment and inventories. The former is driven by utilization rates, capital stock, relative prices, financial market conditions, financial balance sheet conditions, and government policies. Inventory investment is heavily influenced by such factors as past and present sales levels, vendor performance, and utilization rates.

The government sector is divided into federal government and state and local government. Most of the federal expenditure side is exogenous. Federal receipts are endogenous and divided into personal taxes, corporate taxes, indirect business taxes, and contributions for social insurance. State and local sector receipts depend primarily on federal grants and various tax rates and bases. State and local government spending is driven by legal requirements (i.e., balanced budgets), the level of federal grants (due to the matching requirements of many programs), population growth, and trend increases in personal income.

II. **Production and Income.** The industrial production sector includes 74 standard industrial classifications. Production is a function of various cyclical and trend variables and a generated output term, i.e., the input-output (I-O) relationship between the producing industry and both intermediate industries and final demand. The cyclical and trend variables correct for changes in I-O coefficients that are implied by the changing relationship between buyers and sellers.

Pre-tax income categories include private and government wages, corporate profits, interest rate, and entrepreneurial returns. Each of these categories, except corporate profits, is determined by some combination of wages, prices, interest rates, debt levels, capacity utilization rate, and unemployment rate. Corporate profits are calculated as the residual of total national income less the nonprofit components of income mentioned above.

III. **Taxes.** The model tracks personal, corporate, payroll, and excise taxes separately. Tax revenues are simultaneously forecast as the product of the rate and the associated pre-tax income components. The model automatically adjusts the effective average personal tax rate for variations in inflation and income per household, and the effective average corporate rate for credits earned on equipment, utility structures, and R&D. State taxes are fully endogenous, except for corporate profits and social insurance tax rates.

IV. **International.** The international sector can either add or divert strength from the central flow of domestic income and spending. Imports' ability to capture varying shares of domestic demand depends on the prices of foreign output, the U.S. exchange rate, and competing domestic prices. Exports' portion of domestic spending depends on similar variables and the level of world gross domestic product. The exchange rate itself responds to international differences in inflation, interest rates, trade deficits, and capital flows between the U.S. and its competitors. Investment income flows are also explicitly modeled.

V. **Financial.** The Global Insight model includes a highly detailed financial sector. Several short- and long-term interest rates are covered in this model, and they are the key output of this sector. The short-term rates depend upon the balance between the demand and supply of reserves in the banking system. The supply of reserves is the primary exogenous monetary policy lever within the model, reflecting the Federal Reserve's open market purchases or sales of Treasury securities. Longer-term interest rates are driven by shorter-term rates as well as factors affecting the slope of the yield curve. These factors include inflation expectations, government borrowing requirements, and corporate finance needs.

VI. **Inflation.** Inflation is modeled as a controlled, interactive process involving wages, prices, and market conditions. The principal domestic cost influences are labor compensation, nonfarm productivity, and foreign input costs that later are driven by the exchange rate, the price of oil, and foreign wholesale price inflation. This set of cost influences drives each of the industry-specific producer price indexes, in combination with a demand pressure indicator and appropriately weighted composites of the other producer price indexes.

VII. **Supply.** In this model, aggregate supply (or potential GNP), is estimated by a Cobb-Douglas production function that combines factor input growth and improvements to total factor productivity. Factor input equals a weighted average of labor, business fixed capital, and energy. Factor supplies are defined by estimates of the full employment labor force, the full employment capital stock net of pollution abatement equipment, the domestic production of petroleum and natural gas, and the stock of infrastructure. Total factor productivity depends upon the stock of research and development capital and trend technological change.

VIII. **Expectations.** Expectations impact several expenditure categories in the model, but the principal nuance relates to the entire spectrum of interest rates. Shifts in price expectations or the expected government capital needs influences are captured directly in this model through price expectations and budget deficit terms. The former impacts all interest rates and the latter impacts intermediate- and long-term rates. On the expenditure side, inflationary expectations impact consumption via consumer sentiment, while growth expectations affect business investment.

THE IDAHO ECONOMIC MODEL

The Idaho Economic Model (IEM) is an income and employment based model of Idaho's economy. The Model consists of a simultaneous system of linear regression equations, which are estimated using quarterly data. The primary exogenous variables are obtained from the Global Insight U.S. Macroeconomic Model. Endogenous variables are forecast at the statewide level of aggregation.

The focal point of the IEM is Idaho personal income, which is given by the identity:

personal income = wage and salary payments + other labor income + farm proprietors' income + nonfarm proprietors' income + property income + transfer payments - contributions for social insurance + residence adjustment.

With the exception of farm proprietors' income and wage and salary payments, each of the components of personal income is estimated stochastically by a single equation. Farm proprietors' income and wage and salary payments each comprise submodels containing a system of stochastic equations and identities.

The farm proprietor sector is estimated using a highly-aggregated submodel consisting of equations for crop marketing receipts, livestock marketing receipts, production expenses, inventory changes, imputed rent income, corporate farm income, and government payments to farmers. Farm proprietors' income includes inventory changes and imputed rent, but this component is netted out of the tax base.

At the heart of the IEM is the wage and salary sector, which includes stochastic employment equations for 23 North American Industry Classification System employment categories. Conceptually, the employment equations are divided into basic and domestic activities. The basic employment equations are specified primarily as functions of national demand and supply variables. Domestic employment equations are specified primarily as functions of state-specific demand variables. Average annual wages are estimated for several broad employment categories and are combined with employment to arrive at aggregate wage and salary payments.

The demographic component of the model is used to forecast components of population change and housing starts. Resident population, births, and deaths are modeled stochastically. Net migration is calculated residually from the estimates for those variables. Housing starts are divided into single and multiple units. Each equation is functionally related to economic and population variables.

The output of the IEM (i.e., the forecast values of the endogenous variables) is determined by the parameters of the equations and the values of exogenous variables over the forecast period. The values of equation parameters are determined by the historic values of both the exogenous and endogenous variables. IEM equation parameters are estimated using the technique of ordinary least squares. Model equations are occasionally respecified in response to the dynamic nature of the Idaho and national economies. Parameter values for a particular equation (given the same specification) may change as a result of revisions in the historic data or a change in the time interval of the estimation. In general, parameter values should remain relatively constant over time, with changes reflecting changing structural relationships.

While the equation parameters are determined by structural relationships and remain relatively fixed, the forecast period exogenous variable values are more volatile determinants of the forecast values of

endogenous variables. They are more often subject to change as expectations regarding future economic behavior change, and they are more likely to give rise to debate over appropriate values. As mentioned above, the forecast period values of exogenous variables are primarily obtained from Global Insight's U.S. macroeconomic model.

Since the output of the IEM depends in large part upon the output of the Global Insight model, an understanding of the Global Insight model, its input assumptions, and its output is useful in evaluating the results of the IEM's forecast. The assumptions and output of the Global Insight model are discussed in the National Forecast section.

IDAHO ECONOMIC MODEL

EEA_ID = EEA_ID_GOODS + EEA_ID_NONGOODS

EEA_ID_2100 = 3756.170 + 35.092*ID0IP2122_2123 – 3592.187*(JULCNF/WPI10) – 17.062*(IPSG21/ENRM21)
+ 13.231*TREND

EEA_ID_2300 = 15896.610 + 428.758*ID0HSPRS1_A + 367.507*ID0HSPRS1_A(-1) + 306.256*ID0HSPRS1_A(-2)
+ 245.005*ID0HSPRS1_A(-3) + 183.753*ID0HSPRS1_A(-4) + 122.502*ID0HSPRS1_A(-5)
+ 61.251*ID0HSPRS1_A(-6)

EEA_ID_3110 = 20472.000 + 229.171*MOVAV(IPSG311,4) – 335.247*IPSG311/EMN311-40.943*TREND

EEA_ID_3230 = 2260.572 + 17.973*MOVAV(IPSG323,4) – 14.417* MOVAV(IPSG323,8)/MOVAV(EMN323,8)

EEA_ID_3250 = 2383.793 + 15.880*MOVAV(IPSG3253(-1),4) – 1966.268*DUM951ON

EEA_ID_3320 = -1525.860 + 51.072*MOVAV(IPSG332,2)

EEA_ID_3330 = 983.986 + 29.283*IPSG333 – 9.752*TREND

EEA_ID_3340 = 12509.270 + 152.212*MOVAV(IPSG3341,4) + 12.944*DUM911011* MOVAV(IPSG3341,4)
-166.442*IPSG3341/EMD334

EEA_ID_4200 = 6300.244 + 0.312*EEA_ID_44_45 – 28.265*TREND

EEA_ID_44_45 = 34985.170 + 329.400*MOVAV(YPADJ_ID,4)/MOVAV(JPC,4) – 507.552*TREND

EEA_ID_48_49_22 = -7130.418 + 0.964*EEA_ID_4200 + 3.609*MOVAV(ID0KHU,4)

EEA_ID_5100 = -5779.372 + 48.571*MOVAV(IPSG51111,4) + 77.741*TREND

EEA_ID_52_53 = -9555.322 – 5745.451*DUM981ON + 2090.838*(DUM9801004*MOVAV(SP500/SP500(-2),2)
+ 92.204*ID0KHU

EEA_ID_54_55_56 = -39327.670 + 157.096*YPADJ_ID/JPC + 196.031*MOVAV(RADR,8)

EEA_ID_61_62 = -51320.38 + 72.618*ID0NPT + 64404.79*YPADJ_ID/JPC

EEA_ID_71_72 = -49978.400 + 126759.900*ID0NPT – 498.775*TREND

EEA_ID_8100 = 4868.667 + 85.021*MOVAV(YPADJ_ID,4)/MOVAV(JPC,4) + 119.817*DUM931964
- 107.519*TREND

EEA_ID_DMANU = EEA_ID_WOOD + EEA_ID_3320 + EEA_ID_3330 + EEA_ID_3340 + EEA_ID_MFDNEC

EEA_ID_GOODS = EEA_ID_MANU + EEA_ID_2300 + EEA_ID_2100

EEA_ID_GV = EEA_ID_GVSL + EEA_ID_GVF

EEA_ID_GVF = -3267.024 + 1234412.000*EG91*(ID0NPT/N) + 5.215*TREND

EEA_ID_GVSL = EEA_ID_GVSLAD + EEA_ID_ GVSLED

EEA_ID_GVSLAD = -4757.116 + 34092.750*ID0NPT+ 0.296*MOVAV(ID0YPTXB(-4),4)

EEA_ID_GVSLED = 10889.880 + 33946.290*ID0NPT*((N-N16A)/N) +0.537*MOVAV(ID0YPTXB(-4),2)
+109.778*TREND

EEA_ID_MANU = EEA_ID_DMANU + EEA_ID_NMANU

EEA_ID_MFDNEC = -2645.133+ 115.267*MOVAV(ID0IPMFDNEC,2)

EEA_ID_MFNNEC = 974.705 + 1.522*(CNCSR+CNOOR) + 23.110*MOVAV(IPSG322,2)

EEA_ID_NMANU = EEA_ID_3110 + EEA_ID_3230 + EEA_ID_3250 + EEA_ID_MFNNEC

EEA_ID_NONGOODS = EEA_ID_SV + EEA_ID_4200 + EEA_ID_44_45 + EEA_ID_GV

EEA_ID_SV = EEA_ID_48_49_22 + EEA_ID_5100 + EEA_ID_52_53 + EEA_ID_54_55_56 + EEA_ID_61_62 +
EEA_ID_71_72 + EEA_ID_8100

EEA_ID_WOOD = 18620.460 + 129.383*MOVAV(IPSG321,2) – 7056.223*(JULCNF/WPI08)
– 53.829*IPSG321/EMD321 – 56.934*TREND

ID0AHEMF = -2.326 + 14.474*(EEA_ID_DMANU(-1)/EEA_ID_MANU(-1)*JULCNF)
+ 12.894*(EEA_ID_NMANU(-1)/EEA_ID_MANU(-1)*JULCNF)

ID0CRCROP = -83878.880 + 0.0130*CRCROP + 520579.400*WPI01

ID0CRLVSTK = -266035.900 + 0.018*(CRCATCVS+CRDAIRY) + 8904.494*TREND

ID0EXFP = -51876.460 + 1033427.000*WPI01 + 19693.520*TREND

ID0HSPR = ID0HSPRS1_A + ID0HSPRS2A_A

ID0HSPRS1_A = -45.715 – 0.673*(RMMTGEXIST - MOVAV(RMMTGEXIST(-1),4))
+ 147.152*(MOVAV(ID0NPT(-1),4) - MOVAV(ID0NPT(-5),4)) + 0.391*ID0KHU(-1) - 0.630*TREND

ID0HSPRS2A_A = 5.266 + 37.019*(MOVAV(ID0NPT(-1),4) - MOVAV(ID0NPT(-5),4))
– 0.227*MOVAV(RMMTGEXIST,4) – 0.003*TREND* RMMTGEXIST

ID0KHU = ID0KHU1 + ID0KHU2A

ID0KHU1 = ((0.997)^0.25) * ID0KHU1(-1) + ID0HSPRS1_A / 4

ID0KHU2A = ((0.997)^0.25) * ID0KHU2A(-1) + ID0HSPRS2A_A / 4

ID0NB = -10.307 + 38.828*ID0NPT – 0.157*TREND

ID0ND = 0.910 + 5.752*ID0NPT + 0.009*TREND

ID0NMG = (ID0NPT-ID0NPT(-4)) - (ID0NB - ID0ND) / 1000

ID0NPT = 0.492+ 0.000006*EEA_ID+0.002*TREND

ID0WBB$ = ID0WBBMF$ + ID0WBBOTH$ + ID0WBBCC$ + ID0WBBF$ + ID0WBBMIL$

ID0WBBCC$ = (ID0WRWCC$ * EEA_ID_2300) / 1000000

ID0WBBF$ = -92.216+ 277.417*WPI02

ID0WBBMF$ = (ID0WRWMF$ * EEA_ID_MANU) / 1000000

ID0WBBMIL$ = 7.4661 + 299.090*(ID0NPT/N)*GFMLCWSS

ID0WBBOTH$ = ID0WRWOTH$ * (EEA_ID - EEA_ID_2300 - EEA_ID_MANU) / 1000000

ID0WRWCC$ = -326.317 + 2270.794*ID0AHEMF

ID0WRWMF$ = -10703.22 + 3672.345*ID0AHEMF

ID0WRWOTH$ = -15065.87 + 3052.786*ID0AHEMF

ID0YDIR$ = -56.739 +1.053*(YPAINT+ZADIV+YPRENTADJ)*MOVAV(ID0YP$(-1),4)/MOVAV(YP(-1),4)

ID0YFC$ = -23654.050 + 0.930*ID0YFC$(-1) + 35818.350*WPI01

ID0YINV_R$ = -34431.500 + 0.818*ID0YINV_R$(-1) + 65808.35*WPI01

ID0YP = ID0YP$ / JPC*100

ID0YP$ = ID0WBB$ + ID0YSUP$ + ID0YDIR$ + ID0YPRNF$ + ID0YPRF$ + ID0YTR$ + ID0YRA$ - ID0YSI$

ID0YP$PC = ID0YP$ / ID0NPT

ID0YPNF = ID0YPNF$ / JPC*100

ID0YPNF$ = ID0YP$ - ID0YPRF$ - ID0WBBF$

ID0YPNFPC = ID0YPNF$ / JPC*100 / ID0NPT

ID0YPPC = ID0YP / ID0NPT

ID0YPRF$ = 135.913 + 0.176*((ID0CRCROP+ID0CRLVSTK+ID0YTRF$+ID0YINV_R$-ID0YFC$-ID0EXFP)/1000) + 2.938*TREND

ID0YPRNF$ = 56.419 + 4.347*YPPROPADJNF

ID0YPTXB = (ID0WBB$ + ID0YPRNF$ + ID0YDIR$ + (ID0YPRF$ - ID0YINV_R$ / 1000)) / JPC*100

ID0YRA$ = -89.026 + 0.035*ID0WBB$

ID0YSI$ = -18.530 + 2.254*TXSIEC*ID0WBB$/YPCOMPWSD

ID0YSUP$ = 42.979 + 1.575*YPCOMPSUPPAI*ID0WBB$/YPCOMPWSD

ID0YTR$ = -9.222 + 843.599*(YPTRFGF+YPTRFGSL)*(ID0NPT/N)

ID0YTRF$ = 19018.070 + 0.011*TRF$

IDWAGE = (ID0WBB$ - ID0WBBF$ - ID0WBBMIL$) / EEA_ID * 1000000

YPADJ_ID = ID0YPNF$ + MOVAV(ID0YPRF$,4) + MOVAV(ID0WBBF$,4)

ENDOGENOUS VARIABLES

EEA_ID	Employment on nonagricultural payrolls, total
EEA_ID_2100	Employment in mining
EEA_ID_2300	Employment in construction
EEA_ID_3110	Employment in food processing
EEA_ID_3230	Employment in printing
EEA_ID_3250	Employment in chemicals
EEA_ID_3320	Employment in fabricated metal products
EEA_ID_3330	Employment in machinery
EEA_ID_3340	Employment in computers and electronic products
EEA_ID_4200	Employment in wholesale trade
EEA_ID_44_45	Employment in retail trade
EEA_ID_48_49_22	Employment transportation, warehousing, and utilities
EEA_ID_5100	Employment in information
EEA_ID_52_53	Employment in finance, insurance, and real estate
EEA_ID_54_55_56	Employment in professional, scientific, and technical services
EEA_ID_61_62	Employment in health care and educational services
EEA_ID_71_72	Employment in leisure and hospitality
EEA_ID_8100	Employment in other services
EEA_ID_DMANU	Employment in durable goods manufacturing
EEA_ID_GOODS	Employment in goods producing
EEA_ID_GV	Employment in government
EEA_ID_GVF	Employment in federal government
EEA_ID_GVSL	Employment in state and local government
EEA_ID_GVSLAD	Employment in state and local government, administration
EEA_ID_GVSLED	Employment in state and local government, education
EEA_ID_MANU	Employment in manufacturing
EEA_ID_MFDNEC	Employment in other durable manufacturing
EEA_ID_MFNNEC	Employment in other nondurable manufacturing
EEA_ID_NMANU	Employment in nondurable manufacturing
EEA_ID_NONGOODS	Employment in non-goods producing
EEA_ID_SV	Employment in services
EEA_ID_WOOD	Employment in wood products and logging
ID0AHEMF	Average hourly earnings in manufacturing
ID0CRCROP	Cash receipts, crops, not seasonally adjusted
ID0CRLVSTK	Cash receipts, livestock, not seasonally adjusted
ID0EXFP	Farm production expenses
ID0HSPR	Housing starts, total
ID0HSPRS1_A	Adjusted housing starts, single units
ID0HSPRS2A_A	Adjusted housing starts, multiple units
ID0KHU	Housing stock, total
ID0KHU1	Housing stock, single units
ID0KHU2A	Housing stock, multiple units
ID0NB	Number of births
ID0ND	Number of deaths
ID0NMG	Net in-migration of persons
ID0NPT	Resident population

ID0WBB$	Wage and salary disbursements
ID0WBBCC$	Wage and salary disbursements, construction
ID0WBBF$	Wage and salary disbursements, farm
ID0WBBMF$	Wage and salary disbursements, manufacturing
ID0WBBMIL$	Wage and salary disbursements, military
ID0WBBOTH$	Wage and salary disbursements, except farm, manufacturing, and construction
ID0WRWCC$	Average annual wage, construction
ID0WRWMF$	Average annual wage, manufacturing
ID0WRWOTH$	Average annual wage, except manufacturing, construction, and farm
ID0YDIR$	Dividend, interest, and rent income
ID0YFC$	Corporate farm income
ID0YINV_R$	Farm inventory value changes, imputed rent, and income
ID0YP	Total personal income, 2000 dollars
ID0YP$	Total personal income
ID0YP$PC	Per capita personal income
ID0YPNF	Nonfarm personal income, 2000 dollars
ID0YPNF$	Nonfarm personal income
ID0YPNFPC	Per capita nonfarm income, 2000 dollars
ID0YPPC	Real per capita personal income
ID0YPRF$	Net farm proprietors' income
ID0YPRNF$	Nonfarm proprietors' income
ID0YPTXB	Tax base, 2000 dollars
ID0YRA$	Residence adjustment, personal income
ID0YSI$	Contributions for social insurance
ID0YSUP$	Other labor income
ID0YTR$	Transfer payments to persons
ID0YTRF$	Government payments to Idaho farmers
IDWAGE	Average annual wage
YPADJ_ID	Adjusted total personal income